Genesis HIGH SPEED

User Manual

English

7600 Isolated Digitizer

GEN series

HBM

I2707-2.0 en

Document version 2.0 - July 2010

References made to the Perception software are for version 6.0 or higher

For HBM's Terms and Conditions visit www.hbm.com/terms

HBM GmbH
Im Tiefen See 45
64293 Darmstadt
Germany
Tel: +49 6151 80 30
Fax: +49 6151 8039100
Email: info@hbm.com
www.hbm.com/highspeed

Copyright © 2010

All rights reserved. No part of the contents of this book may be reproduced or transmitted in any form or by any means without the written permission of the publisher.

LICENSE AGREEMENT AND WARRANTY

For information about LICENSE AGREEMENT AND WARRANTY refer to www.hbm.com/terms.

Table of Contents

		Page
1	**Safety Messages**	**7**
1.1	FCC and general	7
1.2	Protection	9
1.3	Overvoltage and current protection, isolation	11
1.4	Environment	12
1.5	Power and frequency requirements	13
1.6	Electromagnetic compatibility (EMC)	14
1.7	Electro Static Discharge (ESD)	15
1.8	Laser safety	17
1.9	Instrument symbols	18
1.10	Manual handling of loads	19
1.11	International safety warnings	20
2	**About this manual**	**22**
2.1	Symbols used in this manual	22
3	**Introduction**	**24**
3.1	Introducing the Isolated Digitizer	24
3.1.1	Functional description	25
3.1.2	How to use this manual	27
3.1.3	Technical support	27
4	**Installation and Operation**	**28**
4.1	Introduction	28
4.1.1	Unpacking	28
4.1.2	Unpacking and inspection	28
4.1.3	Equipment checklist	28
4.2	Grounding	29
4.3	Connector locations	31
4.3.1	Front-end I/O connectors	31
4.3.2	Front-end power connector	31
4.3.3	Receiver connectors and indicators	32
4.4	Installation	36
4.4.1	System connections	36
4.4.2	Initial check-out	36
5	**Technical Reference**	**38**
5.1	Introduction	38
5.2	Reference signal	39

5.3	Control output	41
5.4	Power indication and front-end status	42
5.4.1	Power low	42
5.4.2	Status	42
5.5	Shunt measurements	43
5.6	Connectors	44
A	**Mounting the subsystem**	**45**
A.1	Introduction - Mounting the subsystem	45
B	**Specifications**	**46**
B.1	Front-end specifications (Transmitter)	46
B.2	Bandwith plots	51
B.3	Receiver specifications	54
C	**Maintenance**	**58**
C.1	Cleaning	58
D	**Service Information**	**59**
D.1	General	59
D.2	Calibration / verification	60

1 Safety Messages

1.1 FCC and general

The first WARNING note below is required by the FCC and relates only to the interference potential of this equipment. This message is a direct quotation.

WARNING

The equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. As temporarily permitted by regulation, it has not been tested for compliance with the limits for Class A computing devices pursuant to Subpart B or Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference. Operation of this equipment in a residential area is likely to cause interference, in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

This manual contains information and warnings that must be observed to keep the instrument in a safe condition. The instrument should not be switched on if it is damaged and it should not be used under damp conditions.

For the correct and safe use of this instrument it is essential that both operating and service personnel follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

Whenever it is likely that safety protection has been impaired, the instrument must be made inoperative and secured against any unintended operation. Qualified maintenance or repair personnel should be informed. Safety protection is likely to be impaired if, for example, the instrument shows visible damage or fails to operate normally.

This instrument must not be used in life support roles.

For protection against electric shock, all external circuits or equipment shall have a safe insulation. Therefore it is not permitted to connect peripheral equipment to the system with a power supply without SELV (Separated Extra Low Voltage) or Class II qualification.

The international standard for test equipment safety is IEC 61010-1 (formerly IEC 1010-1). It defines four overvoltage categories (CAT I, CAT II, CAT III, and CAT IV), sometimes called installation or location categories, based on the magnitude of danger from transient impulses.

WARNING

All inputs are rated for CAT I (Category 1) signals only. This instrument should not be used to measure high-energy signals of Categories II, III and IV.

The covers protect the user from live parts and should only be removed by suitably qualified personnel for maintenance and repair purposes.

The instrument must not be operated with the covers removed.

There are no user serviceable parts inside.

1.2 Protection

WARNING

This device must be properly earthed.

This unit has a location specifically designed for a protective earth connection. When this unit is in use it should be connected to earth using this connection.

Please see "Connector locations" on page 31 for further details and how to connect the unit to earth.

WARNING

If connection to a protective earth is not possible for any reason then please refer to the international safety standard EN 50191:2000

Disconnecting protective earth can cause high voltage between the 7600 Isolated Digitizer unit and mains power as a result of a (floating) measurement input signal.

WARNING

Do not remove covers. Refer servicing to qualified individuals.

Proper use of this device depends on careful reading of all instructions and labels.

If the instrument is used in a manner not specified by HBM, the protection provided by the instrument can be impaired.

WARNING

This instrument must not be operated in explosive atmospheres.

WARNING

This instrument and related accessories are not designed for biomedical experimentation on humans and should not be directly connected to human subjects or used for patient monitoring.

1.3 Overvoltage and current protection, isolation

All signal inputs are protected against overloads of 250 Vpk (125 Vpk for lower ranges, see specifications) continuously and 800 V transient (impulse spark-over voltage). Exceeding these limits, particularly when connected to potentially high-current sources, can cause severe damage that is not covered by the manufacturer's warranty.

WARNING

The 7600 Isolated Digitizer front-end does not have an internal isolation between the analog (measurement) input BNC connector and the DC power supply connector. This is also true for the control output BNC connector.
The required power isolation between the 7600 Isolated Digitizer front-end and the mains therefore must be provided by the DC power supply unit.

The 7600 Isolated Digitizers are designed to be used in combination with the GEN series Data Acquisition System. The fiber optic cables determine the maximum clearance distance and creepage distance between the Isolated Digitizer and the Acquisition System.

WARNING

The minimum clearance and creepage distance depend on the position of the Isolated Digitizer and the Acquisition System during operation. A safety factor of at least 2 times of the creepage and clearance distance is required.

1.4 Environment

The instrument should be operated in a clean, dry environment with an ambient temperature of between +15 °C and +35 °C.

The instrument is specified for use in a Pollution Category II environment, which is normally nonconductive with temporary light condensation, but it must not be operated while condensation is present. It should not be used in more hostile, dusty or wet conditions.

The instrument will operate between –10 °C and +70 °C.

Note *Direct sunlight, radiators and other heat sources should be taken into account when assessing the ambient temperature.*

The instrument relies on a convection air-cooling design that does not require a fan. Adequate cooling can usually be achieved by leaving a 12.5 mm (0.5" gap) around the instrument.

Do not store the instrument in hot areas. High temperatures can shorten the life of electronic devices.

Do not store the instrument in cold areas. When the instrument warms up to its normal operating temperature, moisture can form inside the instrument, which may damage the instrument's electronic circuit boards.

Do not drop, knock or shake the instrument. Rough handling can break internal circuit boards.

Do not use harsh chemicals, cleaning solvents or strong detergents to clean the instrument. To clean the instrument, disconnect all power sources and wipe the surfaces lightly with a clean, soft cloth.

It is the responsibility of the user to ensure the safety of any accessories, such as probes, used with the instrument.

1.5 Power and frequency requirements

The 7600 Isolated Digitizer operates @ 12 V DC from line voltages between 11 V DC and 15 V DC. The power connection of the 7600 Isolated Digitizer is via a LEMO fixed receptacle (PN EEG.1B.303.CYM) appliance inlet.

To disconnect the instrument from the Power supply, unplug the LEMO connector on the front of the instrument or use software controlled remote power off.

The instrument should be positioned to allow access to the DC connector. The software controlled remote power switch in the instrument is not a disconnecting device. When the instrument is connected some power will be consumed.

CAUTION

Do not position this instrument so that it is difficult to remove the power input cable.

1.6 Electromagnetic compatibility (EMC)

EMC stands for Electro-Magnetic Compatibility. The overall intention is that electronic equipment must be able to co-exist with other electronic equipment in its immediate vicinity and neither emits large amounts of electromagnetic energy. Thus there are two distinct requirements for electromagnetic compatibility: Emission and Immunity.

This instrument generates, accepts and can radiate radio frequency energy and, if not installed and used in accordance with the operator manual, may cause harmful interference to other equipment. However, there is no guarantee that interference will not occur in a particular installation.

Immunity test: All immunity tests are done with the failure criterion being a change of the instrument's control settings. Any of these tests may produce a spurious trigger. Measurements are not valid during and immediately after the immunity tests.

In demanding applications, if this instrument does cause minor harmful interference to other equipment, which can be determined by turning this instrument off and on, the user is encouraged to try to reduce the interference by one or more of the following measures:

- Re-orient or relocate the affected equipment.
- Increase the separation between the instrument and the affected equipment.
- Re-orient or relocate interface cables.
- Connect the instrument to an outlet on a different supply circuit to the affected equipment.

Supply cables, interface cables and probes should be kept as short as practical, preferably a maximum of 1 m. Interface cables should be screened and interface cables longer than 3 m are not acceptable in terms of interference port immunity.

1.7 Electro Static Discharge (ESD)

Electrostatic discharge (ESD) can cause damage to electronic devices if discharged into the device, so you should take steps to avoid such an occurrence.

CAUTION

HBM uses state-of-the-art electronic components in its equipment. These electronic components can be damaged by discharge of static electricity (ESD). ESD damage is quite easy to induce, often hard to detect, and always costly. Therefore we must emphasize on the importance of ESD preventions when handling a system, its connections or a plug-in card.

Description of ESD

Static electricity is an electrical charge caused by the buildup of excess electrons on the surface of a material. To most people, static electricity and ESD are nothing more than annoyances. For example, after walking over a carpet while scuffing your feet, building up electrons on your body, you may get a shock - a discharge event - when you touch a metal doorknob. This little shock discharges the built-up static electricity.

ESD-susceptible equipment

Even a small amount of ESD can harm circuitry, so when working with electronic devices, take measures to help protect your electronic devices, including your GEN series Data Acquisition System, from ESD harm. Although HBM has built protections against ESD into its products, ESD unfortunately exists and, unless neutralized, could build up to levels that could harm your equipment. Any electronic device that contains an external entry point for plugging in anything from cables to acquisition cards is susceptible to entry of ESD.

Precautions against ESD

Make sure to discharge any built-up static electricity from yourself and your electronic devices before touching an electronic device, before connecting one device to another, or replacing acquisition cards. You can do this in many ways, including the following:

- Ground yourself by touching a metal surface that is at earth ground. For example, if your computer has a metal case and is plugged into a standard three-prong grounded outlet, touching the case should discharge the ESD on your body.

- Increase the relative humidity of your environment.
- Install ESD-specific prevention items, such as grounding mats and wrist straps.

While you should always take appropriate precautions to discharge static electricity, if you are in an environment where you notice ESD events, you may want to take extra precautions to protect your electronic equipment against ESD.

The use of wrist straps

Use an ESD wrist strap whenever you open a chassis, particularly when you will be handling circuit cards and appliques. In order to work properly, the wrist strap must make good contact at both ends (with your skin at one end, and with the chassis at the other).

WARNING

The wrist strap is intended for static control only. It will not reduce or increase your risk of receiving an electric shock from electrical equipment. Follow the same precautions you would use without a wrist strap.

1.8 Laser safety

The system is classified as a Class 1 laser product. The 7600 Isolated Digitizer uses an LC optical transceiver for data and command communication between 7600 Isolated Digitizer Receiver and Transmitter. It does not emit hazardous light but it is recommended to avoid direct exposure to the beam.

The built-in laser complies with laser product standards set by government agencies for Class 1 laser products:

- In the USA, the 7600 Isolated Digitizer is certified as a Class 1 laser product conforming to the requirements contained in the Department of Health and Human Services (DHHS) regulation CDRH 21 CFR, Chapter I Subchapter J Part 1040.10.
- Outside the USA, the 7600 Isolated Digitizer is certified as a Class 1 laser product conforming to the requirements contained in IEC/EN 60825-1:1994+A1+A2 and IEC/EN 60825-2.

1.9 Instrument symbols

On the system a variety of symbols can be found. Below is a list of symbols and their meaning.

This symbol is used to denote the measurement ground connection. This point is not a safety ground.

This symbol is used to denote a safety ground connection.

Where caution is required, this symbol refers to the User's Guide for further information.

This symbol warns that high voltages are present close to this symbol.

1.10 Manual handling of loads

The Manual Handling of Loads Directive 90/269/ EEC from the European Community lays down the minimum health and safety requirements for the manual handling of loads where there is a risk particularly of back injury.

Before lifting or carrying a heavy object, ask yourself the following questions:

- Can you lift this load safely, or is it a two-person lift?
- How far will you have to carry the load?
- Is the path clear of clutter, cords, slippery areas, overhangs, stairs, curbs or uneven surfaces?
- Will you encounter closed doors that need to be opened?
- Once the load is lifted, will it block your view?

- Can the load be broken down into smaller parts?
- Should you wear gloves to get a better grip and protect your hands?

Contact the “Occupational Health and Safety” organization, or equivalent, in your country for more information.

The 7600 Isolated Digitizer weighs approximately 1.3 kg maximum:

1.11 International safety warnings

Dansk

SIKKERHEDSADVARSEL
Dækslerne må ikke fjernes.

Nederlands

VEILIGHEIDSWAARSCHUWING
De deksels nooit verwijderen.

Suomi

TURVAOHJEITA
Älä poista suojakansia.

Français

ATTENTION - DANGER!
Ne pas déposer les panneaux de protection.

Deutsch

WARNHINWEIS!
Die Schutzabdeckung nicht entfernen.

Italiano

AVVISO DI SICUREZZA
Non aprire lo strumento.

Norsk

ADVARSEL!
Ikke fjern dekslene.

Português

Aviso de segurança
Não retire o invólucro/capas.

Español

ADVERTENCIA SOBRE SEGURIDAD
No quite las tapas.

Svenska

SÄKERHETSVARNING
Tag ej bort skydden.

English

SAFETY WARNING
Do not remove the covers.

日本語

安全上の警告
カバーは取り外さないでください。

中文

安全警告
不要取下保护盖。

2 About this manual

2.1 Symbols used in this manual

The following symbols are used throughout this manual to indicate warnings and cautions.

WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

WARNING

Indicates an electrical shock hazard which, if not avoided, could result in death or serious injury.

WARNING

Indicates a risk of fire which, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury, or alerts against unsafe practices; or alerts against actions which could damage the product, or result in loss of data.

CAUTION

The ESD Susceptibility Symbol indicates that handling or use of an item may result in damage from ESD if proper precautions are not taken.

HINT/TIP

The info icon indicates sections which give additional information about the product. This information is not essential for correct operation of the instrument, but provides knowledge to make better use of the instrument.

3 Introduction

3.1 Introducing the Isolated Digitizer

Welcome. You have made the right choice: the 7600 Isolated Digitizer is based on the fourth generation of fiber-optic isolated digitizers designed by HBM. Smaller, less weight and improved performance compared to its predecessors make these Isolated Digitizers the leading product for use in the most demanding test lab applications. The digitizers are designed for applications that require high voltage isolation and safe and accurate measurements in harsh electrical environments.

In addition the 7600 Isolated Digitizer offers an improved temperature range and an increased mechanical robustness. It has a heavy-duty stainless steel housing and is exclusively DC powered.

Successful operation of any laboratory, whether independent or manufacturer owned, rely on disturbance free and accurate measurements, also when the object under test has a failure: high frequency oscillating currents flow to earth and cause a high potential shift of the earth point up to many kilovolts. The resulting problems of earthing and power supply connection are less when galvanic isolation from the test area is achieved by means of fiber-optic links. There are two principal ways of transmitting signals via fiber-optic links: analog or digital. With a digital link the measured signal is digitized with an A-to-D Convertor close to the test object, transmitted via the fiber, and processed directly in digital form.
Digital fiber-optic systems do not have drift or noise problems and surpass their analog counterparts when it comes to dynamic accuracy.

In close cooperation with leading European high power laboratories, HBM has developed the 7600 Isolated Digitizer model, a fiber-optic isolated digitizing subsystem with digital link, designed to meet the demands of high power and high voltage measurements.
The 7600 Isolated Digitizer offers remote operation, excellent signal fidelity and elimination of ground problems.

Features and advantages

- Complete single-channel isolated analog input subsystem
- Rugged enclosure for use in EMI hostile environments
- Shock and vibration resistant
- Wide operating temperature range, up to 70 °C (158 °F)
- Digital fiber-optic data transmission for excellent DC stability
- Wide dynamic range and unsurpassed dynamic accuracy
- Up to 100 MegaSample/s sample rate at 14-bit resolution
- Combines with dedicated GEN series 4-channel receiver board with 900 MegaSample on-board memory

3.1.1 Functional description

A **system** always consists of one (or more) Isolated Digitizer transmitters and one (or more) receiver cards. One GEN series receiver card serves up to four transmitters.

For each data channel the system has a front-end (the 7600 Isolated Digitizer), a twin fiber-optic link, data channel receiver and storage unit. The data channel receiver and storage unit is part of a GEN series four-channel receiver card.

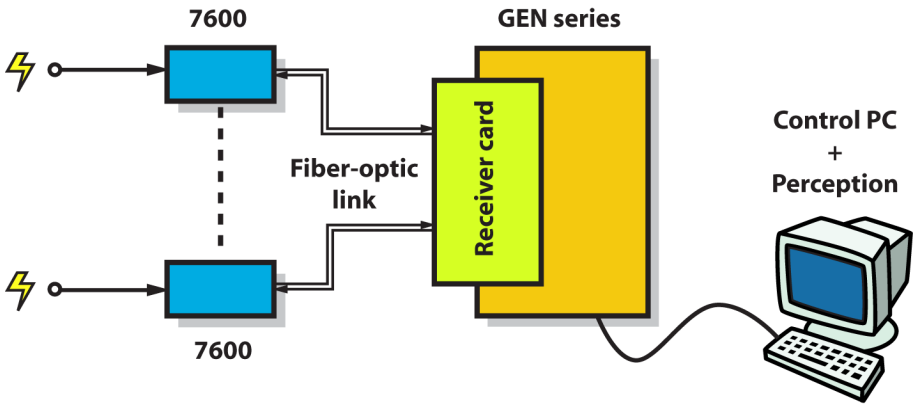

Figure 3.1: System block diagram

The front-end comprises a high-fidelity programmable amplifier with anti-aliasing (AA) filter, the A-to-D Converter, control logic, fiber-optic interfacing and a power management system.

The programmable amplifier has ranges from ± 20 mV to ± 100 V. The A-to-D Converter has a sample rate of 100 MegaSamples per second (10 ns time resolution) and 14-bit accuracy (0.006%).

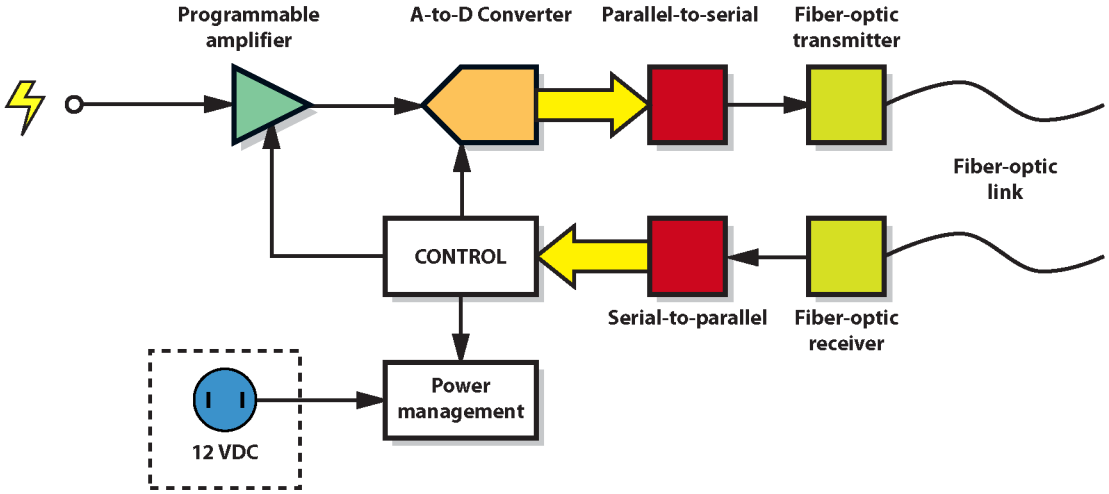

Figure 3.2: 7600 block diagram

Data emerging from the A-to-D Converter is serialized before transmission. Therefore only one fiber-optic cable is required for data transmission. This approach reduces cost and increases reliability and ease of handling.

The data-receiving end of the system consists of fiber-optic interfacing and de-serializing, digital trigger circuitry, buffer memory for local data storage and control logic. It provides all standard functions of a GEN series subsystem. The fiber-optic isolation is fully transparent to the user.

Special design ensures both short-term and long-term interchannel synchronization.

3.1.2 How to use this manual

This manual has been written to help you to benefit as fast as possible from the 7600 Isolated Digitizer and to get maximum results from its usage.

Many people read their user's manual only as a last resort. If you are one of those, the next paragraphs tell you where to find information when you need it.

IMPORTANT

READ THE NEXT SECTION EVEN IF YOU DON'T READ ANYTHING ELSE.

WARNING

This unit can be hazardous if not used in the correct way.

Safety Messages

Proper and safe use of this instrument depends on careful reading of all safety instructions and labels. Read the chapter "Safety Messages" on page 7 for details.

Installation and Operation

To know how to install this system in the correct way, read the installation section. We do not advise to install the system without reading this section.

This section includes important information on how to be compliant with hazard and safety regulations, how to earth the unit properly to avoid dangerous voltages, and how to use the subsystem. For details read the chapter "Installation and Operation" on page 28.

Technical Reference

This section contains additional technical information pertinent to the 7600 Isolated Digitizer. Read the chapter "Technical Reference" on page 38 for details.

3.1.3 Technical support

Contact your local dealer or HBM directly for technical support, general information and more. Refer to the back of this manual for address details.

4 Installation and Operation

4.1 Introduction

This section describes how to install and operate the 7600 Isolated Digitizer, which is the front-end (or transmitter) section. The receiver card(s) should already have been factory installed into the GEN series system.

4.1.1 Unpacking

For transportation the Isolated Digitizer is sealed in a polyethylene bag and cushioned in its box by shock-absorbent material. Accessories are separately sealed in polyethylene bags and included in the box.

4.1.2 Unpacking and inspection

Unpack the instrument carefully and examine it thoroughly to ascertain whether or not damage has occurred in transit. Report immediately any such damage to the agent or manufacturer.

Retain the packing materials and box for use if further transportation is necessary. Also be sure to keep all documents supplied with the instrument; some may be addenda or update bulletins applicable to the manual or instrument.

4.1.3 Equipment checklist

Check that the equipment contained in the transportation box complies with the packing list. It typically includes:

- 7600 Isolated Digitizer front-end.
- Optional connectors.
- Fiber-optic cables as ordered.
- Operation Manual that you are reading now.
- Power connector.
- Miscellaneous documents.

4.2 Grounding

It is important when operating or handling this unit to make sure it is correctly grounded via a connection to earth.

The primary purpose of protective grounding is to provide adequate protection against electric shock causing possible death or injury to personnel while working on de-energized equipment. This is accomplished by grounding and bonding, to limit the body contact or exposure to voltages at the work-site to a safe value, if the equipment were to be accidentally energized from any source of hazardous energy. The greatest source of hazardous energy in most cases is direct energizing of the equipment from a power-system or source.

Equipment

The unit is supplied with a connection to be used for protective grounding.This grounding should consist of an assembly of appropriate lengths of copper cable with electrically and mechanically compatible connections and clamps at each end. The Cable should be continuous in length and contain no splices, breaks or junctions.

The position of the grounding connection on the 7600 is located to one side on the rear of the instrument as shown in Figure 4.1.

Figure 4.1: 7600 side view with earth position

A Earth position

The location of the safety earth is shown in Figure 4.1. To use the safety earth correctly please refer to the example image in figure Figure 4.2. This shows an example of how the unit should be connected so that it is properly earthed via a safety earth and cable.

WARNING

If connection to a protective earth is not possible for any reason then please refer to the international safety standard EN 50191:2000

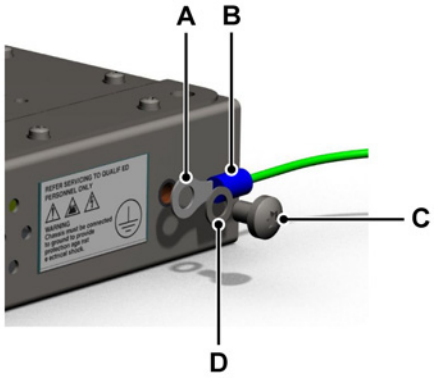

Figure 4.2: 7600 side view with earth position (detail)

A Terminal: Ring 16-14Ga ring diameter .265” (example AMP 320563)
B Wire : 16 AWG yellow/Green
C Screw: ISO7045 M6x8 Torx T30
D Washer: Spring washer DIN137A M6

All together there are 4 screws and 4 spring washers which are mounted in the unit.

Note *These screws should only be removed in the event that the unit is being fitted to or removed from a rack mount. Otherwise they should be left fastened in the original and correct position as originally supplied.*

4.3 Connector locations

This section describes the location of the various connectors on the 7600 Isolated Digitizer front-end.

4.3.1 Front-end I/O connectors

Refer to the following diagrams for the position of the signal input and fiber-optic connectors on the front-end cabinets.

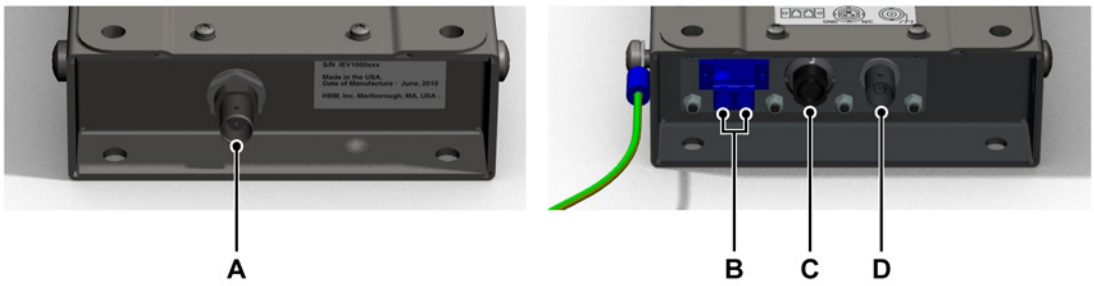

Figure 4.3: Front-end I/O connectors

A **Signal input**

B **Fiber Optic communication link** This connector is used in combination with a fiber-optic plug connector LC. As seen from the front, the left-most fiber-optic link transmits the data (Data Output) and the right-most fiber-optic link receives the commands (Command Input).

C **DC Power inlet** Refer to section “ Front-end power connector” on page 31 for details.

D **Control output** Refer to section “Control output” on page 41 for details.

4.3.2 Front-end power connector

The DC power inlet of the 7600 Isolated Digitizer is located on the rear of the front-end cabinet.

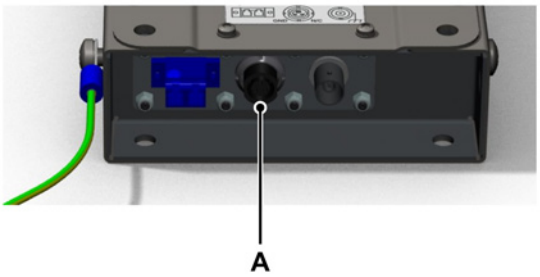

Figure 4.4: 7600 rear view with DC power inlet

A- Power inlet The power connection of the 7600 Isolated digitizer is via a LEMO fixed receptacle (PN EEG.1B.303.CYM). The 7600 Isolated digitizer requires 12 VDC, 11 VDC minimum to 15 VDC Maximum @ 0.6 A maximum.

Refer to the diagram below for the connector pinning.

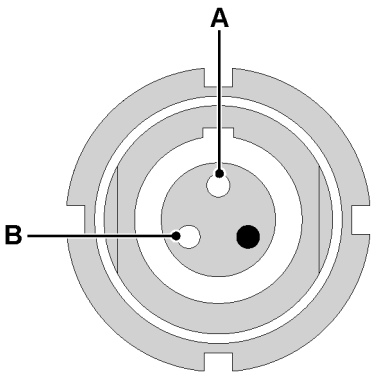

Figure 4.5: Power connector (detail)

A Top pin = + 12 VDC

B Ground

The mating connector for the front-end power connector is a LEMO straight plug, type FGG.1B.303.CYC or FGG.1B.303.CLA (soldering contacts). One plug is delivered as standard with the unit.

4.3.3 Receiver connectors and indicators

The receiver is a card that is inserted in the GEN series data acquisition system. One receiver card serves up to four front-ends (transmitters).

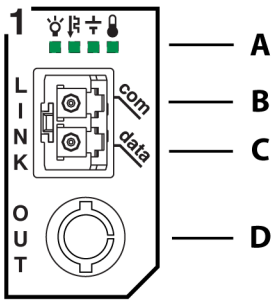

Figure 4.6: Receiver connectors and indicators of a single channel

A Status LED's

B Command output fiber-optic

C Data input fiber-optic

D Monitor output

A- Status LED's The LED indicators are used to give a visual indication of the fiber-link / front-end status.

The icon is used to identify the signal detect function. The icon is for Data/ Synchronization identification. The icon gives the status of the front end input power. The last icon, identifies the temperature status of the front-end. When the power of the mainframe is switched on, at least one LED should be illuminated.

The following table gives the function and possible combinations of the four LED's.

Table 4.1: Front panel LED indicators

FRONT PANEL LED INDICATORS				
Color				
Off	No power, or boot failure	No optical signal detected	No optical signal detected	No optical signal detected
Red	No optical signal detected	Not synchronized, no valid data	Power low	Front-end temperature out of bounds

FRONT PANEL LED INDICATORS				
Orange	N/A	Synchronized, but no valid data	N/A	N/A
Green	Optical signal detected	Synchronized and valid data	Battery power OK	Front-end temperature within limits

B- Command output This connector provides the command and timing output and must be connected using fiber-optic cable with the “Optical Link - Command” connector on the frontend cabinet.

The Command Output and Data Input are combined in a dual LC® connector.

C- Data input This connector is the data input connector and must be connected using fiberoptic cable with the “Optical Link - Data” connector on the front-end cabinet.

The Command Output and Data Input are combined in a dual LC® connector.

Figure 4.7: Example of a dual LC connector

D- Monitor output This is a BNC output. It provides a copy of the analog signal connected to the analog input connector on the front-end.

Note *Within the front-end a temperature sensor is mounted to monitor the internal temperature of the unit. When the temperature inside the unit rises above 90 °C (194 °F), the LED on the front-panel of the GEN series receiver card turns red. This indicates that the internal temperature of the unit is high, but not too high: the unit remains completely functional. However, care must be taken: when the internal unit temperature rises further to above 95 °C (203 °F) the front-end unit will shut down automatically after one (1) minute. After this thermal shutdown the unit will cool off and resume normal operation automatically after 5 minutes. Because the ambient room temperature is typical 15 °C to 20 °C less than the internal unit temperature the unit can be operated up to 70 – 75 °C (158 °F – 167 °F) typical environmental temperature without warning.*

4.4 Installation

4.4.1 System connections

Connect the front-end and the mainframe by means of a fiber-optic cable. The fiber-optic cable must be a dual-core cable. Both sides feature a dual LC connector. Cables supplied by HBM are already correctly configured.

Using the fiber-optic cable, connect the dual LC connector to the receiver card (select any of the four ports). The other end of the cable goes to the front-end.

Insert the plug into the receiver. Make sure the lock mechanism is positioned to the right. You hear a ´click´ when the lock mechanism locks the cable. To disconnect the LC connector, push the lock mechanism and gently pull the connector out of the port on the receiver. Do not use excessive force to pull out the plug.

When you are using your own fiber-optic cables make sure that the COMMAND and DATA lines are connected correctly: command-out of the receiver to the command-in of the frontend; data-out of the front-end to the data-in of the receiver.

4.4.2 Initial check-out

For an initial check-out of the system verify as follows:

- Check the unit is connected to earth via the safety earth ground terminal.
- Check the fiber-optic cabling between the front-end and the receiver card in the GEN series mainframe.
- Check DC power supply unit and connections.
- Is the mainframe installed properly: fuses, power selection, power cord connected?

Now you can switch on the GEN series mainframe and the front-end(s).

CAUTION

The 7600 uses a dedicated GEN series receiver board. You cannot mix 6600 and 7600 Isolated Digitizers.

The LED’s on the front panel of the fiber-optic receiver card must indicate that both connection and power are OK for each channel installed and connected.

This completes the installation. Refer to the GEN series User Manual for more hardware information and to the Perception User Manual for software information.

5 Technical Reference

5.1 Introduction

This section contains additional technical information pertinent to the 7600 Isolated Digitizer and its usage.

5.2 Reference signal

The 7600 provides a reference signal that can be used to test the complete link from analog input on the front-end to data display on the control PC without the need of a real-world signal.

This reference signal is generated in the front-end and can be switched into the analog amplifier under remote control.

The reference signal is a square wave of approximately 504 Hz with a 50 % duty cycle. For exact electrical details refer to the specification section.

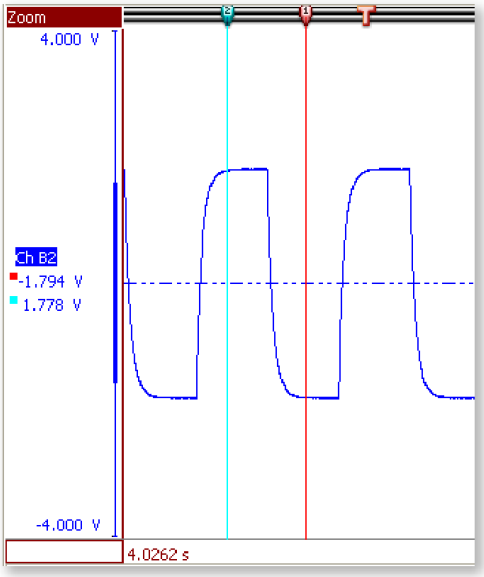

Figure 5.1: Example of the reference waveform

The reference signal can be switched on and off within the Perception by using the signal coupling of a 7600 channel.

To do so proceed as follows:

1. In Perception go to the **Settings** sheet.
2. In the task pane of the Settings sheet select in the **Input** group the **Basic-Voltage** option.
3. For the necessary channel(s) select for **Signal coupling** the **Reference** option.
4. To display the reference signal go to the **Active** sheet, make sure the necessary channel(s) are displayed and click **Pause** in the acquisition control.

Note *The reference signal amplitude is either 0.18 Vpp or 3.6 Vpp. This depends on the selected input range. See specifications for details. For some actual input ranges this will result in overrange or underrange situations that prohibit accurate level measurements.*

5.3 Control output

The 7600 provides a control output that can be used to drive an external device. This output is located at the back of the instrument and has a BNC connector. The output is an open-collector type. For electrical details refer to the specification section.

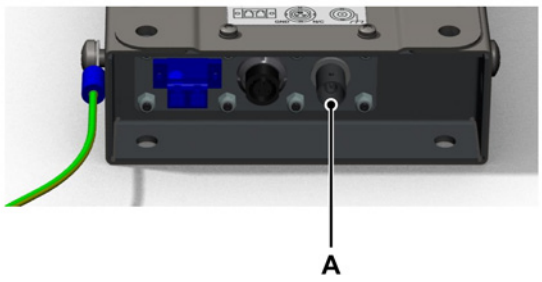

Figure 5.2: Isolated Digitizer 7600 rear view

A Control output

To do so proceed as follows:

1. In Perception go to the **Settings** sheet.
2. In the task pane on the settings sheet select in the **General** group the **Analog Channel** option.
3. One of the columns is labeled **Control out** and has the following icon:
4. Select the channel(s) you want to use and in the Control out column click to enable (on = closed) or disable (off = open) the control output.

5.4 Power indication and front-end status

5.4.1 Power low

The “power low” indication on the receiver front panel becomes active when the power voltage has gone below the 10.4 V (approximately) level, and stays active until the 9.2 V (approximately) level is reaches. Below this level the front-end will not function any more.

5.4.2 Status

The 7600 Isolated Digitizer has an extensive set of on-board diagnostics and status information. This information is visible in the Perception control software. To see this information you need to go to the Fiber Status sheet that is committed completely to the status information of Fiber Optic Isolated Digitizers.

When this sheet is not readily available you must add it. To add the Fiber Status sheet do one of the following:

1. On the **File** menu point to **New Sheet** and select **Fiber Status** in the submenu.
2. Right-click in the tab area of the sheet. On the shortcut menu point to **New Sheet** and select **Fiber Status** in the submenu.
3. When the toolbar is available click the **Create new sheet** icon and select **Fiber Status** in the drop-down menu.

5.5 Shunt measurements

Special care must be taken with shunt measurements. Typical shunt measurements generate signals with an amplitude of only a few volts. To prevent interference from higher voltage signals (up to 100 volt) the following guidelines apply:

- Use only coaxial cable for all measurements.
- When possible place the 7600 Isolated Digitizer front-end as close as possible to the test object to reduce the length of the coax cable.
- Physically separate low voltage signal lines and high voltage signal lines as much as possible. Do not combine them. When the higher voltage signals include high frequency transients these will easily cross over to the low voltage signals.

CAUTION

Keep in mind that very strong magnetic fields can influence the amplifier setting relays!

Note that the 7600 Isolated Digitizer has a relatively high bandwidth of 25 MHz. As a result of this high bandwidth you may see high frequency transients that you have never seen before. Use the filter to reduce the bandwidth to a physical relevant value.

5.6 Connectors

The following connector types are used.

Input connectors	
Analog input	BNC
Fiber optic link	LC duplex
DC Power	LEMO fixed receptacle (PN EEG.1B.303.CYM)

GEN series receiver card	
Fiber optic link	LC duplex
Monitor output	BNC

A Mounting the subsystem

A.1 Introduction - Mounting the subsystem

You can mount the 7600 Isolated Digitizer front-end into a rack designed to hold measurement equipment. Use the drawing below to determine the exact position of the mounting holes with respect to the housing.
Two sides of the housing have 2 mounting holes, the bottom side of the housing provides 4 mounting holes.
When mounting the unit make sure to leave enough free space. The unit relies on a convection air-cooling design that does not require a fan. Adequate cooling can usually be achieved by leaving a 12.5 mm (0.5") gap around the instrument.

Use M6 screws only that do not penetrate the housing more than 10 mm (0.4"). For more information about dimensions details refer to the graphic Figure A.1 "7600 Isolated Digitizer mounting holes" on page 45.

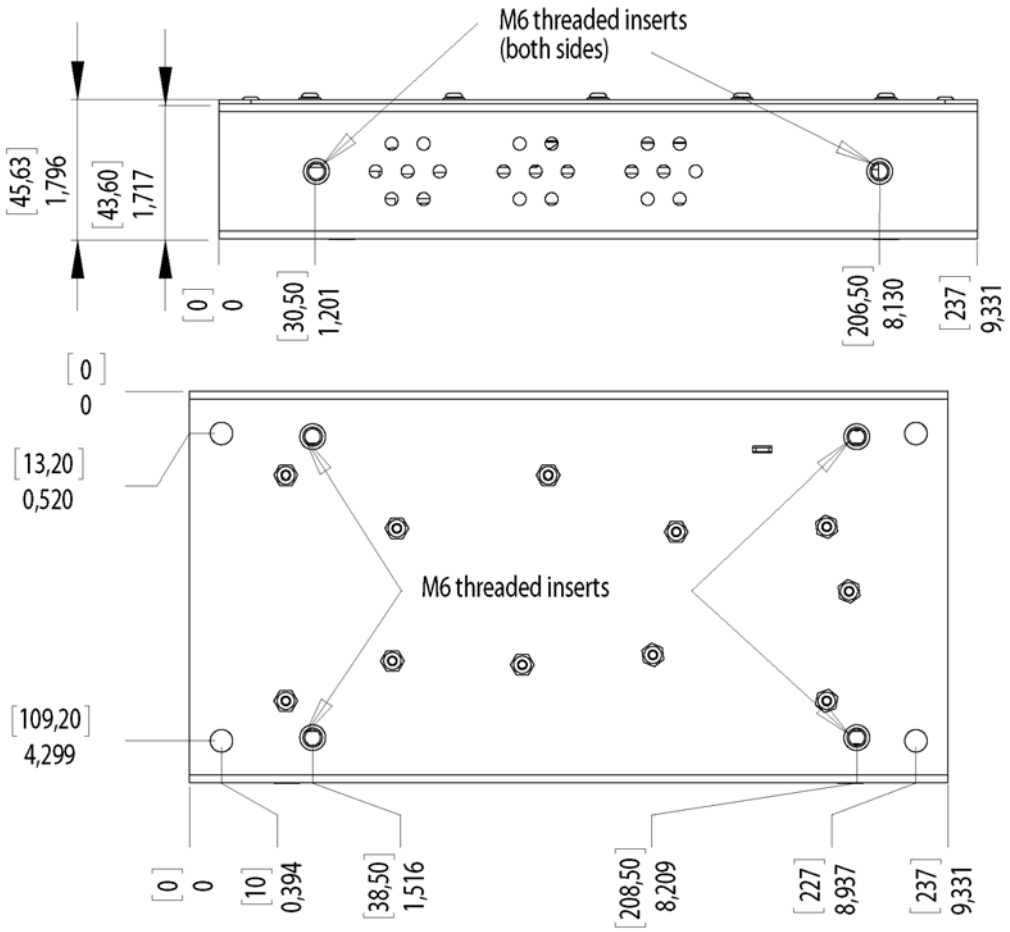

Figure A.1: 7600 Isolated Digitizer mounting holes

B Specifications

B.1 Front-end specifications (Transmitter)

The 7600 Isolated Digitizer front end transmits data for high voltage applications to a receiver card.

Analog input section		
Component	**Unit Description**	**Value**
Channels	Per front-end	1
Input type	Single-ended to isolated common (unbalanced differential) (1)	1
Coupling	AC / DC / GND / Reference	
Connector	BNC	1
Ranges	Full Scale in 1, 2, 5 steps	± 20 mV to ± 100 V
Zero suppression	Automatic, equal to range	
Impedance		1 MΩ (± 2 %) // 38 pF (± 5 %)
Bandwidth	@ -3 dB (wideband) @ -3 dB (filtered)	25 MHz 10 MHz
Passband flatness	Ranges: ± 0.1 dB over full temperature range	< 4 V, DC to 2.5 MHz
	Ranges: ± 0.2 dB over full temperature range	≥ 4 V, DC to 2.5 MHz
CMRR	@ 80 Hz (1)	100 dB
MSE		0.1 % FS ± 50 µV RTI(2)
Offset error		0.1 % FS ± 50 µV RTI(2)
Noise (RMS)		0.05 % FS ± 0.1 mV RTI
Bias current		< 2 nA
Rise time		14 ns
Recovery time(3)	To 10 % following a 200 % Full Scale input	≤ 10 ns
	To 0.1 % following a 200 % Full Scale input	≤ 50 ns
Overload	Protected for ranges ≥ ± 2 V 125 Vpeak protected for ranges < ± 2 V	250 Vpeak

Analog input section		
Component	**Unit Description**	**Value**
	Transient (impulse spark-over voltage at 1 kV/µs)	800 Vpeak
Anti-alias filter	Low-pass at 10 MHz	6th order Bessel

Testing and control section		
Component	**Unit Description**	**Value**
Power On/Off (transmitter)	Controlled by Perception	
Reference signal accuracy	Switched on via “Coupling” in Perception	
	Square wave	504 Hz +/- 1.8 V and +/- 0.09 V
	Amplitude	+/- 0.5 %
	Frequency	+/- 2 %
Control Out	Switched on via "Control-Out" in Perception	
	Open collector output, sink-current	< 50 mA
	Maximum open voltage; remotely controlled (open/closed) from Perception software to control e.g. external power supply	12 V

Digitizer section		
Component	**Unit Description**	**Value**
Conversion	A-to-D Converter per channel Synchronous sampling between channels	Single
Conversion rate		100 MS/s
Resolution		14 bit (0.006 %)
	In enhanced mode (4)	16 bit
Aperture jitter		200 fs

Fiber-optic link		
Component	**Unit Description**	**Value**
Light source	Class 1 laser product	1
Connector	LC Duplex	1
Transfer rate		2 Gbit/s
Wavelength		1310 nm
Cable type	Single mode	9/125 µm

Fiber-optic link		
Component	**Unit Description**	**Value**
Dynamic range		+ 9 dB
Isolation		10^{15} Ω/meter
Cable length	See Accesories	
Maximum length(5)	Typical with standard off-the-shelf cable	4 km
	Maximum with low-loss fiber optic cable	12 km

DC Power		
Component	**Unit Description**	**Value**
Supply	Normal	12 V DC
	Minimum	11 V DC
	Maximum	15 V DC
	Maximum operating current	0.6 A
	Maximum in sleep mode	80 mA
	Isolation	SELV
Warnings	Low voltage warning	10.4 V
	Automatic shut down	9.2 V
Overheat	Red LED at receiver front panel indicates a transmitter internal temperature	90 °C
	(Externally)	(approx. 70 °C)
Overheat protection	Transmitter shutdown Automatic restart trial every 5 minutes after shutdown	95 °C
	(Externally)	(approx. 75 °C)
Connector	Lemo	FGG.1B.303

Physical and environmental specifications		
Component	**Unit Description**	**Value**
Dimensions	Width	122.4 mm (4.82")
	Depth	237.0 mm (9.33")
	Height	45.6 mm (1.79")

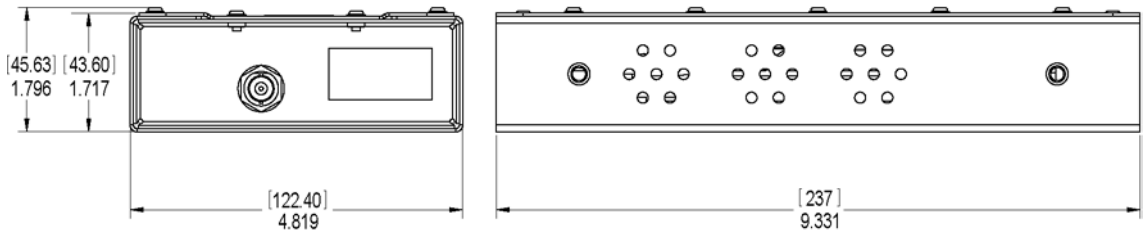

Figure B.1: Isolated Digitizer 7600 Dimensions

Physical and environmental specifications		
Component	**Unit Description**	**Value**
Weight	Maximum	1.3 kg
Shielding	Stainless Steel housing	(304)
Operating temp.	Normal operating temperatures	-10 °C to +70 °C (14 °F to 158 °F)
Humidity	Relative humidity (non-condensing)	0 % - 80 %
Altitude	Maximum operational altitude	2000 m (6100 ft)
Shock	acc. MIL-PRF-28800F Class 1, Non-operational Shock test	30 g halfsine, 11 ms
	Transit drop test: height	460 mm
Vibration	Non-operational acceleration test	23.045 grms, 10 – 1500 Hz
	All three axes for	30 seconds per axis
Protection	IP Rating	IP20

Notes

(1) Using an 'ideal' isolated power supply.

(2) MSE and Offset error over the full temperature range will be 1 % of Full Scale.

(3) Measured with a 1 kHz square wave signal at an input range of 1 V and no filter (wideband).

(4) For sample rates ≤ 10 MHz and with digital filter ON.

(5) Without additional connectors or patch boards.

All specifications are typical @ 25 °C (77 °F) unless otherwise stated and subject to change without notice in order to improve design- and/or performance characteristics.

Consult www.hbm.com/highspeed for more information.

Ordering information		
Component	**Unit Description**	**Value**
Single channel transmitters	7600 Enhanced isolated digitizer, 100 MS/s, Single Mode FO link	Consult HBM

B.2 Bandwith plots

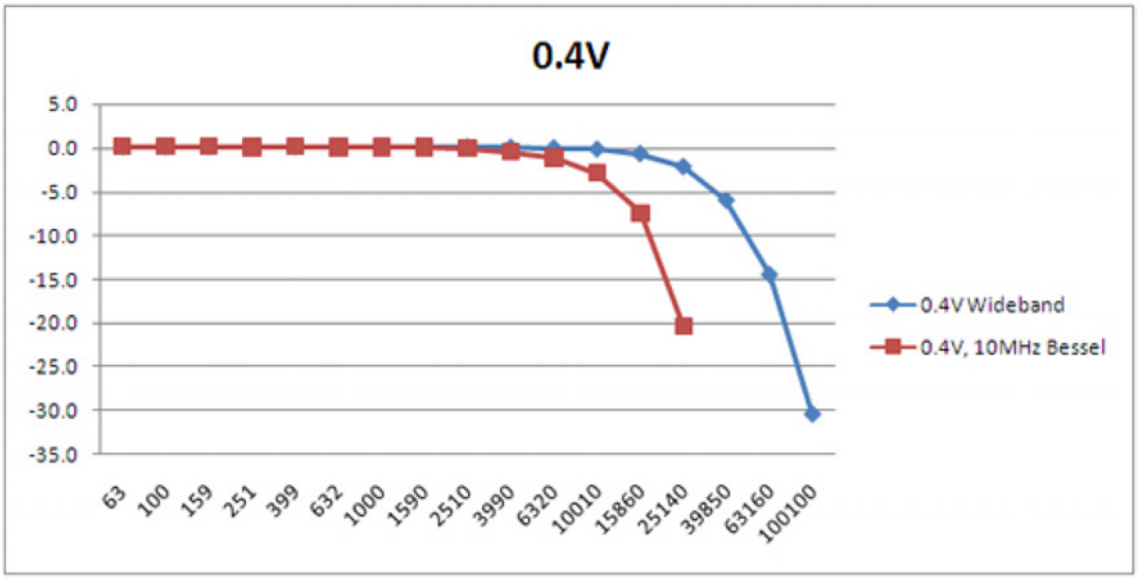

Figure B.2: Bandwidth plot in 0.4 V range

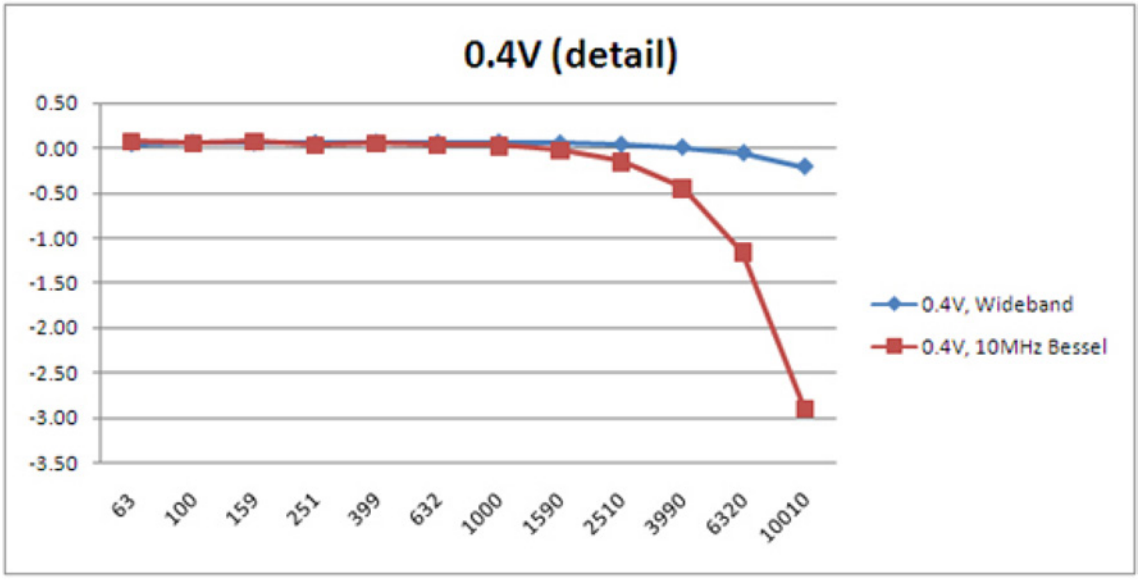

Figure B.3: Bandwidth plot in 0.4 V range (detail)

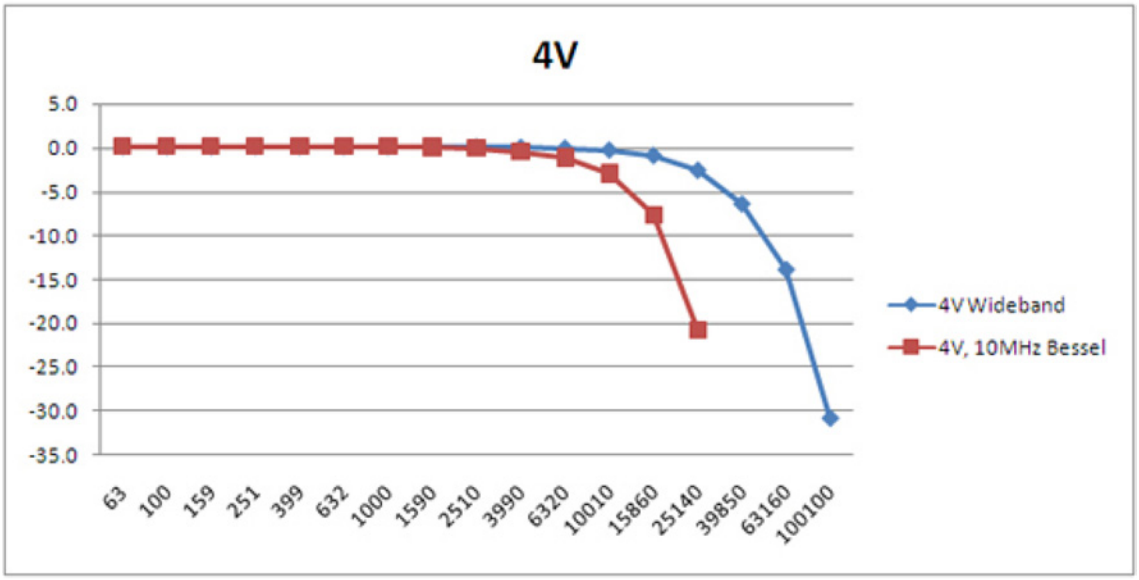

Figure B.4: Bandwidth plot in 4 V range

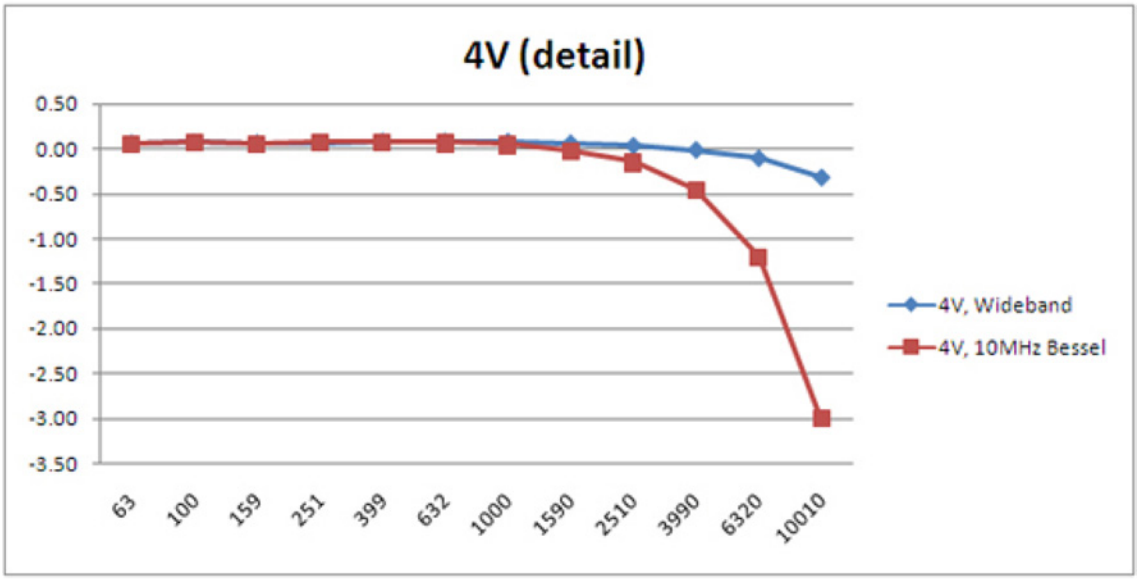

Figure B.5: Bandwidth plot in 4 V range (detail)

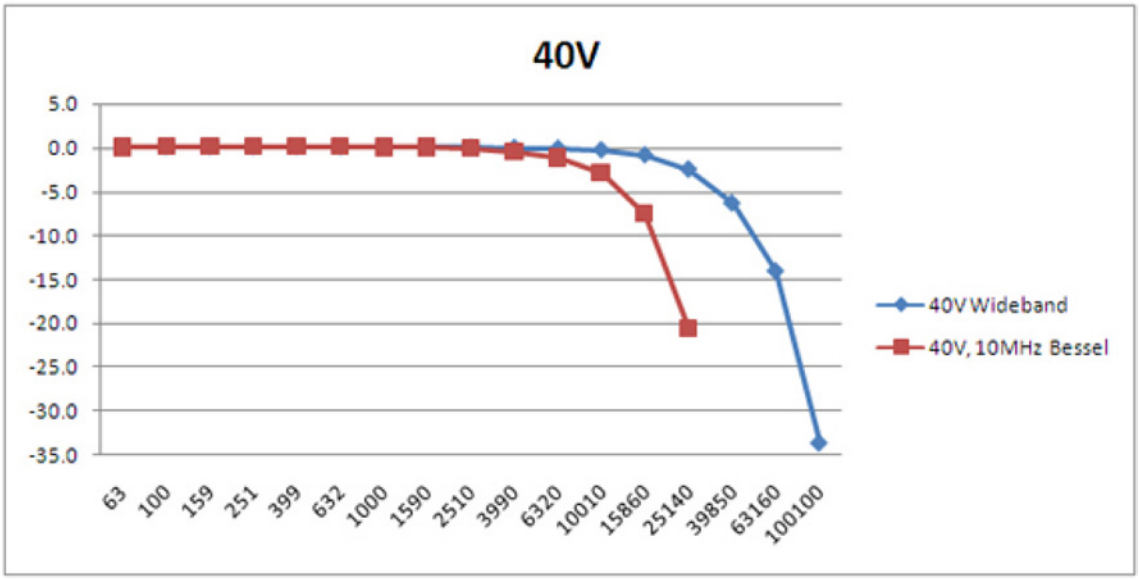

Figure B.6: Bandwidth plot in 40 V

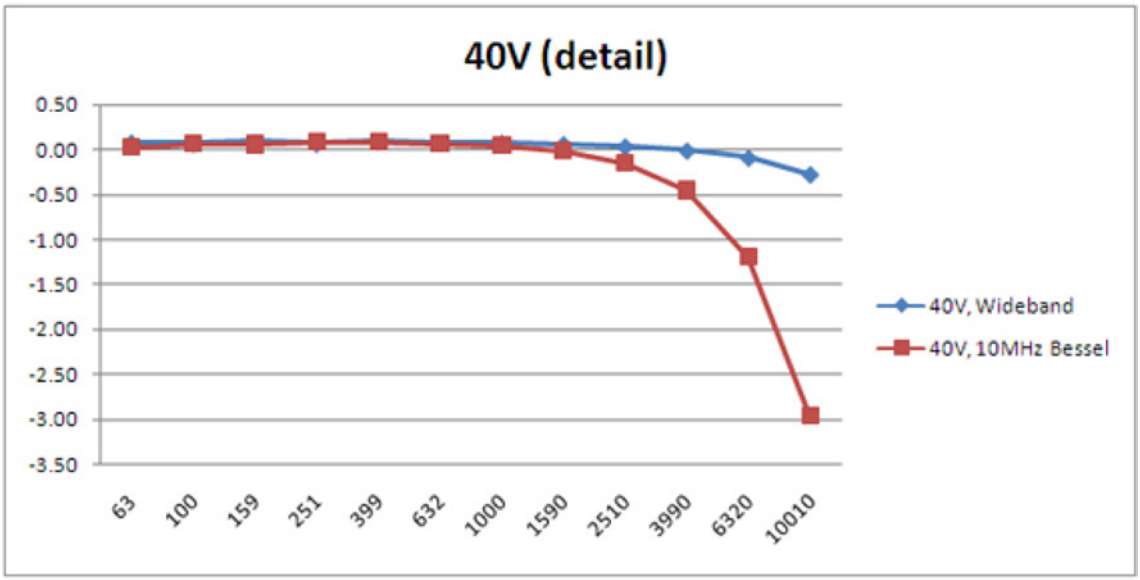

Figure B.7: Bandwidth plot in 40 V range (detail)

B.3 Receiver specifications

A single GEN series receiver card serves up to four 7600 Isolated Digitizer frontends. For detailed information on the GEN series system refer to the “ GEN series Data Acquisition User Manual”.

Fiber-optic link		
Component	**Unit Description**	**Value**
Light source	Class 1 laser product	1
Connector	LC Duplex	1
Transfer rate		2 Gbit/s
Wavelength		1310 nm

Filtering		
Component	**Unit Description**	**Value**
Digital filters	Sample rate fs: No filter	100 MS/s
	Sample rate fs: User selectable in range 5 MHz to 50 kHz in 12 steps	< 100 MS/s

Monitor output		
Component	**Unit Description**	**Value**
Outputs	one BNC per channel on receiver front panel	
Output level	Full Scale (± 0.5 %)	± 5 V
Output current		± 20 mA
Output load		> 250 Ω
Conversion	D-to-A Converter per channel	Single
Conversion rate		100 MS/s
Resolution		14 bit (0.006 %)
Output filter	6-pole Bessel	10 MHz @ – 3 dB
Delay (1)	Delay from input to output: Minimum: (filter = wideband) Maximum: (filter = 50 kHz)	 < 1 µs 12 µs

Transient memory		
Component	**Unit Description**	**Value**
Capacity	On-board, to be used by enabled channels	900 MS (1.8 GigaByte)

Triggering		
Component	**Unit Description**	**Value**
Type	Dual-level trigger digital trigger detector per channel	
Pre/post trigger	Pre- and post trigger segment can be zero samples up to full memory length	
Rate	Maximum	1 trigger/10 ms up to 100 triggers/s
	Zero re-arm time	
Resolution	On each level	16 bit (0.0015 %)

Acquisition modes	
Component	**Unit Description**
Recorder	For continuous acquisition
Scope	For repetitive phenomena
Transient	For intermittent events; single, dual or A-B-A timebase

Data Storage		
Component	**Unit Description**	**Value**
Recorder	Spooled directly to hard disk of control PC. Unlimited file size or duration.	
	Maximum transfer rate:	10 MS/s per channel
Scope	Store in transient memory	
Transient	Store in transient memory; single or A-B-A timebase	

Notes

(1) With 1 meter of fiber optic cable.

All specifications are typical @ 25 °C (77 °F) unless otherwise stated and subject to change without notice in order to improve design- and/or performance characteristics.

Consult www.hbm.com/highspeed for more information.

Ordering information		
Component	**Unit Description**	**Order Number**
Four channel receiver	7600 Enhanced receiver card for Genesis system. Single Mode FO transmission. Accepts only 7600 Isolated digitizers. Includes 900 MS transient memory	Consult HBM

Accessories (to be ordered separately)				
Component	**Unit Description**		**Length**	**Order Number**
Fiber Optic Cables **KAB288**	Standard Isobe7600 Cable Pair (Patch panel/Indoor use only) 7600 Standard Zipcord fiber optic Single Mode cable, 0,5 dB/km loss, LC-LC connectors, Yellow		2 m	1-KAB288-2
	Diameter	2.4 x 4.8 mm (0.09" x 0.19")	10 m	1-KAB288-10
	Weight	14 kg/km (9 lbs/ 1000 ft)	20 m	1-KAB288-20
	Tension long term	529 N (119 LBS)	50 m	1-KAB288-50
	Bend radius	30 mm (1.2")	100 m	1-KAB288-100
	Operating temp	0 °C to +70 °C		
	Color	Yellow		

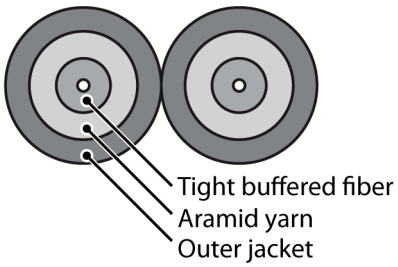

Figure B.8: Standard Isobe7600 Cable Pair

Component	Unit Description		Length	Order Number
Fiber Optic Cables **KAB289**	7600 Indoor/Outdoor fiber optic Single Mode cable, 0,5 db/km loss, LC-LC connectors, Black		2 m	1-KAB289-2
	Diameter	5.8 mm (0.23")	10 m	1-KAB289-10
	Weight	32 kg/km (21.5 lbs/ 1000 ft)	20 m	1-KAB289-20
	Crush resistance	2000 N/cm	50 m	1-KAB289-50

Accessories (to be ordered separately)				
Component	**Unit Description**		**Length**	**Order Number**
	Tension long term	290 N (66 LBS)	100 m	1-KAB289-100
	Bend radius	5.8 cm (2.3")	150 m	1-KAB289-150
	Operating temp.	-46 °C to +85 °C	300 m	1-KAB289-300
	Color	Black		

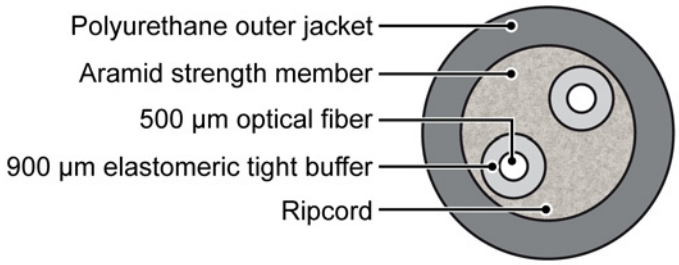

Figure B.9: Heavy Duty Isobe7600 Cable

C Maintenance

C.1 Cleaning

To clean the instrument, disconnect all power sources and wipe the surfaces lightly with a clean, soft cloth.

The 7600 Isolated Digitizer front-end cabinet does not require additional routine cleaning.

D Service Information

D.1 General

HBM offers comprehensive factory servicing for all HBM Data Acquisition products. Extended warranties for calibration, repair or both are available. Installation, on-site or factory training are also available. Contact the factory or your local sales person for more information. For local contact information, visit www.hbm.com/highspeed.

If servicing is ever needed on your 7600 Isolated Digitizer, contact the factory with the model and serial numbers, a description of the problem, and your contact information. You will be issued a Return Material Authorization (RMA) number. Attach this number to the unit and/or the accompanying paperwork.

During the warranty period, the customer pays for shipping to HBM. HBM will pay for the return of the equipment in the same fashion as it was received. Outside the warranty period, a quote will be given. A purchase order must be received before work can be performed.

It is recommended that the unit always be shipped in the original shipping container.

D.2 Calibration / verification

The 7600 Isolated Digitizer is factory calibrated as delivered to the customer. The 7600 Isolated Digitizer should be tested and if necessary, calibrated, at one year intervals or after any major event that may effect calibration. When in doubt consult your local supplier.

The 7600 Isolated Digitizer front-end and receiver are calibrated independently. Therefore any combination of front-end and receiver will give the listed specifications.

Index

C

Calibration 60
Calibration (system) 60
Checklist 28
Cleaning 58
Command output 34
Connectors 31, 44
Control output 41

D

Data Input 34

E

EMC 14
Environment 12
ESD 15

F

FCC 7
Front-end power connector 31
Functional description 25
Fuse 9

G

Ground 15
  Symbol 18
Grounding 29
  Equipment 29

H

High voltage
  Symbol 18

I

Inspection 28
Installation 28
  Initial check-out 36
  System connections 36
Introduction 24
Isolation 11

L

LICENSE AGREEMENT AND WARRANTY 3

M

Maintenance
  Cleaning 58
Monitor output 34

O

Overvoltage 11

P

Power and frequency requirements 13
Power inlet 31

R

Receiver card 32
Receiver connectors and indicators 32
Reference Signal 39

S

Safety
  Clearance 11
  Current 11
  EMC 14
  Environment 12
  ESD 15
  FCC and general 7
  Instrument symbols 18
  International warnings 20
  Isolation 11
  Manual handling of loads 19

Overvoltage 11
Service 59
Shipping 59
Warranty 59
Shunt measurements 43
Symbols 18, 22

U

Unpacking 28

Head Office
HBM
Im Tiefen See 45
64293 Darmstadt
Germany
Tel: +49 6151 8030
Email: info@hbm.com

France
HBM France SAS
46 rue du Champoreux
BP76
91542 Mennecy Cedex
Tél:+33 (0)1 69 90 63 70
Fax: +33 (0) 1 69 90 63 80
Email: info@fr.hbm.com

Germany
HBM Sales Office
Carl-Zeiss-Ring 11-13
85737 Ismaning
Tel: +49 89 92 33 33 0
Email: info@hbm.com

UK
HBM United Kingdom
1 Churchill Court, 58 Station Road
North Harrow, Middlesex, HA2 7SA
Tel: +44 (0) 208 515 6100
Email: info@uk.hbm.com

USA
HBM, Inc.
19 Bartlett Street
Marlborough, MA 01752, USA
Tel : +1 (800) 578-4260
Email: info@usa.hbm.com

PR China
HBM Sales Office
Room 2912, Jing Guang Centre
Beijing, China 100020
Tel: +86 10 6597 4006
Email: hbmchina@hbm.com.cn

© Hottinger Baldwin Messtechnik GmbH. All rights reserved.
All details describe our products in general form only.
They are not to be understood as express warranty and do
not constitute any liability whatsoever.

measure and predict with confidence

I2707-2.0 en